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Distribution and biology of the White-cheeked Cotinga *Zaratornis stresemanni*, a high Andean frugivore

by Theodore A. Parker, III

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Though the avifauna of the massive Cordillera Occidental of the Peruvian Andes is now relatively well known, few of its endemic species have been studied in detail. Especially interesting from a biogeographical and ecological standpoint are those birds that inhabit the relict Temperate Zone woodlands that occur on the western slopes of the range between latitudes 8°S and 14°S, in an elevational range of 2500 m to 4500 m. One of the most exciting discoveries made by Maria and Hans-Wilhelm Koepcke during their explorations of these woodland patches was the previously undescribed White-cheeked Cotinga *Zaratornis stresemanni*. This thrush-sized bird was found, surprisingly, less than 70 air km east of Lima in the *Oreopanax* association forest of Zárate, above the Rimac River valley at 2700 m. The species was described from 2 female specimens collected in October 1953 (Koepcke 1954). When news of the discovery reached American ornithologists in 1954, another specimen, a female collected by M. A. Carriker above Yánac in northern Ancash in March 1932, was discovered in the collection of the Philadelphia Academy of Sciences, where overlooked for more than 20 years (Bond 1955).

Males of this cotinga were not known until found in 1966 in an isolated *Polylepis* woodland in the upper Santa Eulalia Valley, the next valley north of the Rimac, at more than 4000 m (Lüthi 1970). When I visited Yánac in 1976, the sexes had never been found together, and there was speculation that long distance migrations (e.g. across the Rimac Valley) must join them for the reproductive period (Lüthi 1970). Furthermore, the apparent separation of males and females into 2 distinct habitats, with the former occurring in higher *Polylepis* and the latter in *Oreopanax*, led the Koepckes to conclude that if either habitat were destroyed by man the species might become extinct. This seemed corroborated by the fact that *Zaratornis* could not be found by them above Yánac where the *Oreopanax* groves just above

the village had been greatly reduced by local people. I now believe that this interesting bird is more or less resident in one habitat, *Polylepis* woodland, and that post-breeding dispersal accounts for individuals or groups of individuals that occur in other (lower) areas, like the forest of Zárate.

Because of the enigmatic nature of this species, and because of the paucity of information of Andean cotingas in general, I became interested in *Zaratornis* and from 1974 to 1978, while working for the Louisiana State University Museum of Zoology (LSUMZ), I was able to observe this bird in 3 localities. Because of the lack of information on *Polylepis* woodlands, I include a list of conspicuous plant genera represented in them, and some of the other characteristic bird species found in them. Morphological data from specimens of *Z. stresemanni* in the LSUMZ are presented in Table 1.

Table I

Mensural data from specimens of *Zaratornis stresemanni* in the LSUMZ.

	sex	wing (chord) mm	tail mm	tarsus mm	weight g	locality
63561	♂	111	85	25.7	52.5	Santa Eulalia
78601	♂	115	86	26.5	46	Santa Eulalia
78602	♂	114	87	25.5	—	Santa Eulalia
82016	♂	114	84	26.0	56.5	Túpac (Yánac)
34665	♀	111	87	26.5	47	Zárate
34666	♀	112	86	26.8	52	Zárate
34667	♀	114	87	26.8	55	Zárate
82015	♀	113	90	—	54	Túpac

Typical soft part colours are as follows: iris red; bill light bluish-grey; tarsi and feet dark brown.

DISTRIBUTION

Since the discovery of *Zaratornis* at Zárate in 1953, this bird has been found in 7 localities, 6 on the western slopes of the Western Andes, and one on the western flank of the Eastern Andes in the upper Marañón River drainage. From north to south the localities and the elevations at which *Zaratornis* was found are as follows:

Tayabamba (3250 m), Departamento de La Libertad (sight record by LSUMZ personnel, M. Robbins, pers. comm.); above Yánac (Bond 1955) and Quebrada Túpac (3650–4250 m), c. 25 km by trail south of Yánac, Dpto. Ancash (pers. obs.); Quebrada Llanganuco (c. 3400–4300 m), east of Yungay, Dpto. Ancash (sight records by E. Mackrill and J. Rowlett, pers. comm.); Quebrada Quicar (c. 3700 m), east of Chancay, Dpto. Lima (sight record by T. Mischler, pers. comm.); c. 13 km W. Milloc (3600–4200 m) in the upper Santa Eulalia Valley, Dpto. Lima (Lüthi 1970, and pers. obs.); and Pampa Galeras (3650 m), c. 50 km east of Nazca, Dpto. Ayacucho (Brokaw 1976, and pers. obs.). The known elevational range of the species is 2700 to 4240 m. I predict that the bird will eventually be found to inhabit the *Polylepis* zone of western Dpto. La Libertad, and it may in fact range south to northern Dpto. Arequipa.

My observations were made in 3 of the above localities: Quebrada Túpac, the upper Santa Eulalia Valley, and Pampa Galeras.

HABITAT

The habitat of *Zaratornis* is *Polylepis* spp. (Rosaceae) woodland surrounded by shrubbery and grassland. At the northern end of the distributional range

of the species these isolated tracts grow on steep, rocky slopes of deep quebradas, often glacial valleys, separated from one another by high puna grasslands and rugged snow-covered mountains. Most of the habitat there is remote and difficult to reach. In the south *Polylepis* is more accessible. The woodlands at Pampa Galeras occur on moderate slopes that rise above great expanses of level grasslands. At Zárate this bird has been found in a relict Temperate Zone forest of a variety of tree species (see Ferreyra 1978).

On the study sites *Zaratornis* was noted mainly in small groves less than one hectare in size, separated from each other by grassy and shrub-dotted areas or rockslides. Average tree height on the 3 sites was as follows: Túpac – 5 m, Santa Eulalia – 5 m, Pampa Galeras – 3.5 m. The largest trees in the first 2 localities had diameters at breast height (DBH) of up to 80 cm. Other prominent plant growth noted were woody shrubs of the following Compositae: *Gynoxys* spp. (very common at Túpac), *Vernonia* sp. (at the lower edge of the Santa Eulalia woods), *Chuquiraga* sp. (Santa Eulalia and Pampa Galeras), *Senecio* spp. and *Baccharis* spp. (all localities). *Lupinus* spp. (Leguminosae) were also prominent in all localities, and a *Berberis* sp. (Berberidaceae) was noted at the Santa Eulalia site and at Pampa Galeras. All these shrubs grow mainly along the edges of the woodlands. The ground below the trees is covered with grasses and other herbaceous growth.

Of greatest importance to the cotinga is the presence in the *Polylepis* of two conspicuous, orange-flowered mistletoes of the Loranthaceae, *Tristerix chodatianus* at Túpac and Santa Eulalia, and (probably) *Ligaria cuneifolia* at Pampa Galeras. The former was the only fruit-producing plant observed at Túpac, and certainly the most important one found in the upper Santa Eulalia Valley. At Pampa Galeras *Ligaria* was the only observed food source for *Zaratornis*. Koepcke (1958) mentioned *Phrygilanthus peruviana* (=*Tristerix secundus*) as an important food item for the cotingas *Zaratornis* and *Ampelion rubrocristata*. Clumps of these 3 mistletoes grow at or near the ends of *Polylepis* branches at all heights in the trees.

Characteristic bird species that inhabit *Polylepis* woodlands (and spend most of their time in or under the trees) at Túpac (1), in the upper Santa Eulalia Valley (2), and Pampa Galeras (3) include:—

Aglaeactis cupripennis (1, 2), *Metallura phoebe* (all) (this and the last hummingbird species are important pollinators of the mistletoe flowers), *Leptasthenura yanacensis* (1), *L. pileata* (all), *Cranioleuca antisiensis* (1, 2), *Grallaria andicola* (1, 2), *Scytalopus magellanicus* (1), *Ochthoeca oenanthoides* (all), *O. rufipectoralis* (1), *O. leucophrys* (2, 3), *Oreomanes fraseri* (all), *Xenodacnis parina* (1, 2), *Atlapetes rufigenis* (1), *A. nationi* (2), *Carduelis atrata* (all), *C. uropygialis* (2), and *C. crassirostris* (all). Conspicuous mammals observed in association with *Polylepis* at Túpac were White-tailed Deer *Odocoileus virginianus*, Taruca or Peruvian Huemul *Hippocamelus antisiensis*, and Mountain Viscacha *Lagidium peruanum*.

Climatologically *Polylepis* woodlands are part of the arid Puna Zone environment. Rains fall mainly from January to March, often in the form of snow or ice. Tovar (1973) provides the following data for Pampa Galeras:— annual rainfall there during 1966–1969 averaged 822 mm, of which 663 mm fell during the above 3-month period; only 13 mm were recorded from May to September, while October to December received a range of 23.4 to 49.3 mm; warmest average daily temperatures were noted during the wet months (January to March = 6.3°C), while the coolest period was June to August (3°C); average daily highs ranged from 10.9°C (March) to 13.6°C (September to November); lows were 6.7°C (July) to 1.5°C (January);

throughout most of the year days are warm and sunny, and nights are clear and cold. Unfortunately, weather data for localities at the northern end of the range of *Zaratornis* are not available.

Zaratornis – MISTLETOE INTERDEPENDENCE

One of the most interesting aspects of *Zaratornis* ecology is its apparent mutualism (or perhaps symbiosis) with the mistletoes *Tristerix* and *Ligaria*. At Túpac and in the Santa Eulalia Valley this cotinga was seen to feed solely on the fruits of *Tristerix chodatianus*. The elevational and geographic distribution (Ancash to Ica) of this little-known plant (J. Kuijt, in litt.) coincides closely with that of *Zaratornis*. At Pampa Galeras the cotinga appeared to be dependent on another mistletoe, probably *Ligaria cuneifolia* (see Tovar 1973). In all 3 localities, the seeds of these plants were being dispersed, through regurgitation, onto *Polylepis* branches.

During foraging bouts, the cotinga perched on mistletoe clumps and swallowed up to 5 berries in succession. Within a few minutes individuals flew to another perch site, either an exposed calling perch or a sheltered limb within the foliage of a tree. There, after 5–10 minutes more, the sticky seeds were regurgitated, one by one, and wiped onto the surface of the limb. I never saw a seed fall to the ground during this process and assume that a very high proportion of all fruits taken are successfully dispersed in this manner. The exposed dead branches of calling perches were thickly covered with regurgitated seeds, and examination of less frequently used perch sites of living branches and limbs also revealed seeds, a few in various stages of germination. The seeds, quite large for mistletoes (A. Gentry, pers. comm.), are apparently always regurgitated.

Zaratornis was the only frugivorous bird observed on all study sites, and is probably the sole dispersal agent for mistletoes growing above 3000 m. It appears that both species of mistletoes produce fruit throughout the year, though fruit seemed to be less abundant during the dry months August–October. This might account for the post-breeding dispersal of part of the *Zaratornis* population and subsequent appearance of the species in wooded areas at lower elevations (e.g. Zárate).

Obligate interdependence of birds and mistletoes has been reported previously for the avian genera *Euphonia* and *Dicaeum* (Kuijt 1969: 45–46). Interestingly, at least some species in these genera have specialized digestive tracts for handling large numbers of small mistletoe seeds. The *Zaratornis* – mistletoe interdependence represents a different type of co-adaptive system, whereby relatively small numbers of large fruits are taken, and a high proportion of their seeds are dispersed to a possible germination site. It is tempting to speculate on the degree to which this bird and its food plants may have co-evolved. Detailed studies of the biology of both these organisms are needed before such a process can be understood.

GENERAL BEHAVIOUR

Almost nothing has been written about the behaviour of *Zaratornis* or its 2 close relatives *Ampelion rubrocristata* and *A. rufaxilla*. Farrand (*in* Snow 1973) wrote: "In its [*Zaratornis*] general behaviour it is very like *Ampelion rubrocristata*. In a manner very reminiscent of that species it often pops up suddenly onto a dead snag and sits upright, looking about rather nervously.

The flight of *Zaratornis* is very similar to that of *Ampelion* and both species approach a perch flying low and making a final upward sweep, rather like that of a kestrel or shrike." As noted by Koepcke (1958), individuals characteristically perch quietly, often for long periods, atop a tree on a favourite exposed branch. This is apparently a part of nesting or feeding territory surveillance, though *Ampelion rubrocristata* occasionally hawks insects from the air about such perches (pers. obs.). Though I have never seen *Zaratornis* take an insect in any manner, I would expect them to do so from time to time.

At seemingly long but regular intervals, loud songs or calls are uttered from the calling perches (see below). When disturbed, a bird perched in the open usually bobbed its head and flicked its wings and tail in a nervous manner. Birds on territory (see under nesting behaviour) often pursued conspecifics that had entered the defended area. Territories of mated pairs at Túpac were small, averaging (very) approximately 100 m x 60 m (n=6).

Twice I observed a display between members of a mated pair. In both instances this occurred after both birds had been foraging. One individual (the sexes are monomorphic) flew from a mistletoe clump to a conspicuous calling perch where it was soon joined by the second bird. Both faced each other, and, while less than a foot apart, bowed towards each other slightly, and began head bobbing and wing flicking. After 30–60 seconds, these displaying birds regurgitated *Tristerix* seeds onto the exposed surface of the *Polylepis* branch. During this type of display no sounds were uttered. Similar posturing and behaviour were exhibited by members of feeding aggregations (4–10 individuals) noted in August and September in the Santa Eulalia Valley.

VOCALIZATIONS

Like other cotingas, *Zaratornis* has a rather limited, unmusical repertoire. The primary song of the species, which under normal conditions is repeated 3–6 times at intervals of 30 to 60 seconds, is a loud, low-pitched series that may be written as: "reh-reh-reh-reh-rrrrrrrrrrr-ré-ré." It averages c. 4 seconds in length, and falls within a frequency range of 2–4 kHz (see Plate 1). This vocalization speeds to a roll towards the middle and ends with 2–3 emphatic notes; it is nasal in quality and sounds rather froglike at a distance. It is given by both members of territorial pairs, usually from the tip of an exposed calling perch, and also by members of feeding aggregations during the non-breeding season. Calling normally begins in the morning (8.00–9.00) when sunlight first illuminates a woodland. One calling bird is usually answered by several others in adjacent groves. Calling is most frequent during early morning and late afternoon.

A regularly heard disturbance call uttered by incubating birds upon being flushed from a nest, and also by adults engaged in intra-specific territorial encounters, is a drawn-out "raaaaaaah". Contact notes between members of pairs or feeding aggregations are short but similar in quality to other vocalizations ("reh" "reh" "reh" etc.). While calling, birds remain upright and almost motionless.

Tape-recordings of this species are on deposit at the Cornell University Library of Natural Sounds.

NESTING BEHAVIOUR

Prior to 1976, *Zaratornis* had not been found breeding. The female specimen

Plate 1a. Primary song of *Zaratornis stresemanni*.

Plate 1b. Nest and eggs of *Zaratornis stresemanni*. (Photo by M. D. Williams.) See T. A. Parker III.

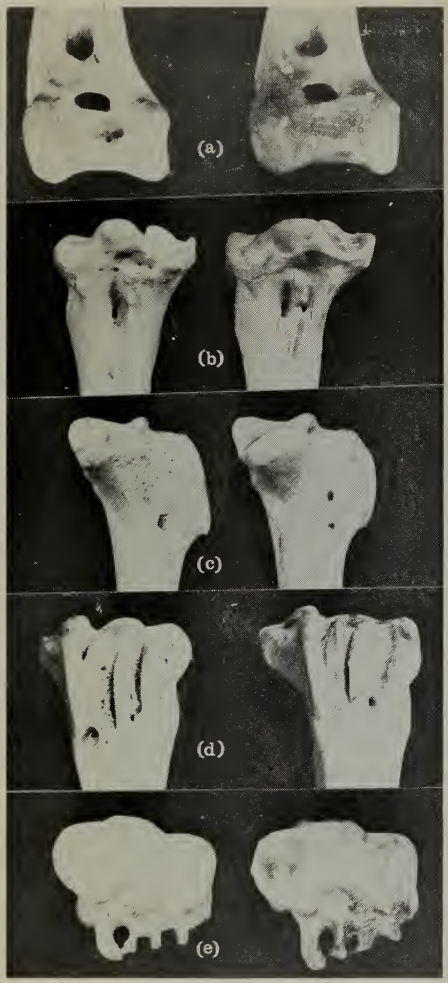

Plate 2A (left). The right tarsal joint and hypotarsus in Whooper Swans *Cygnus cygnus cygnus* (left) and Mute Swans *C. olor* (right). (a) Anterior view of tibiotarsal condyles. (b) Anterior view of tarsometatarsal head. (c) Internal hypotarsal ridge. (d) Posterior view of hypotarsus. (e) Proximal view of tarsometatarsal head, posterior side downwards. Threequarters actual size, Photography by M. J. Ashby.

See Northcote (p. 266).

Plate 2B (below). Sooty Falcon *Falco concolor*. *Left*, Perched in dead tree. Note dark patch in front of eye, large feet and long wings *Right*. In flight. Note long wings and dark primaries. (Taken from 35 mm colour slides by R. Liversidge.)

See Liversidge, Richardson and Gubb (p. 268).

collected by Carriker above Yánac in March 1932 was stated to be in "breeding" condition, but with no further details. Frank P. Frazier, Jr. accompanied the Koepckes and Hans Lüthi on their 1966 visit to the upper Santa Eulalia Valley, when the first male specimens were obtained, and recently made available the following notes from that trip (in litt.): "March 26. . . . Once we started getting into the woods I saw a bird in a treetop which I recognized . . . as *Zaratornis*. We didn't see more until a bit later, when we reached a clear spot in the woods. We found that there were plenty of *Zaratornis* in these woods (which cover maybe 30 acres, more vertical than otherwise), appearing to be in pairs. Dr. [Maria] Koepcke found what she thought was an old nest, and saw birds carrying bits of the loose bark of the trees, presumably nesting material. We collected 3 specimens, one of which seemed a bit clearer in plumage and perhaps is a male (hitherto unknown). She said *Zaratornis* went in groups or individually in Zárate, but [she] never [found] any sign of breeding there. Apparently it does here . . . she was most pleased at her findings here about 'her' bird." The above specimens were indeed males, and the above locality has since been proved to be a breeding area.

Between 23 and 31 May 1976, I found 4 nests in active use in Quebrada Tútapac. A fifth was found in the upper Santa Eulalia Valley on 6 May 1978. All were discovered by locating presumably mated pairs in small, isolated tree groves away from the larger wooded areas that occur in ravines or along the bases of cliffs. In both localities these groves were on the south slopes of the quebrada, and received up to 3 more hours of sunlight daily than the north slopes. Considering the very low (freezing) night and early morning temperatures of this environment, the added hours of warmth may influence nest site selection. Though mistletoe was present in trees on the north slopes, few cotingas were seen there, and no nests were found despite diligent searching.

All nests were well hidden within large clumps (0.5–1 m dia.) of *Tristerix* near the ends of tree branches from 4–7 m above ground, and within 1–3 m of a trunk. All were fully shaded by surrounding mistletoe branches and foliage of *Polylepis*.

The fifth nest, which resembled the others very closely in overall size and construction (Plate 1) was collected (LSUMZ-MDW#2312). It was a well-made, rather deep cup of mosses and greenish-grey lichens, the latter being especially concentrated around the perimeter of the cup, which was lined with coarse green and yellow grasses; a few small (15–70 mm) twigs had also been incorporated into that structure. This nest had an outside diameter of 140 × 160 mm, an outside depth of 83 mm, an inside diameter of 76 × 80 mm, and an outside depth of 42 mm. It contained 3 eggs measuring 32.4 × 21.6, 32.6 × 22.1 and 33.3 × 21.6 mm. These were Greenish Glaucous of Ridgway (1912), with a distinct wreath of brownish and greyish-brown flecks about the larger end, and a few additional flecks of the same colours scattered over the entire egg.

Two of the 4 Tútapac nests contained 2 young and one egg, a third held 2 eggs and one nestling, and a fourth, which definitely contained at least one young bird, could not be reached for closer examination. One of the above eggs was collected but broken before measurements could be taken (LSUMZ, not catalogued). The nestlings of the 3 examined nests were well-feathered for their small size, and resembled adults in colouration. All were very quiet

in the nest and held their eyes closed even as I lifted them out for closer examination.

Only 2 adults, presumably a male and a female, were observed in the immediate vicinity of each nest site. At nests with eggs, one bird appeared to be doing most, if not all, of the incubation. Incubating adults could almost be touched before flushing to a nearby limb. The second adult of a pair usually appeared only after the first had flushed and uttered alarm calls, or when taped songs were played within the nesting area.

Both adults fed nestlings regurgitated fruit; generally only one adult visited the nest at a time. Of each pair, one adult, presumably the male, was definitely more aggressive and vocal in response to playbacks of songs. Due to work obligations I was unable to obtain detailed information on incubation or feeding rates.

CONSERVATION

Despite its rather restricted geographical and elevational distribution, *Zaratornis Stresemanni* does not appear to be a threatened species. In all 3 of my study areas it was a relatively common bird, and similar suitable habitat surely occurs in many (often inaccessible) quebradas throughout its range. That this unique cotinga is a bird of such restricted habitat does, however, mean that its survival is assured only as long as suitable tracts of its habitat are preserved. A study of the population dynamics of this and other avian species that inhabitat *Polylepis* woodlands is badly needed; such studies will enable us at least to make educated guesses concerning what is "suitable" in terms of reserves.

As mentioned by Ferreyra (1977), *Polylepis* woodlands of the Peruvian Andes have probably been greatly reduced in size over the last several thousand years. The scarcity of wood at these elevations in the dry Western Andes has pressured man into cutting *Polylepis,* or queñua as the local people know it, for building purposes, especially roof beams, fence rails and firewood, but at present large tracts of this forest type exist, mainly on steep slopes far from villages. Although cutting, especially for firewood, should be expected to continue, I was told in Yánac that the introduction of eucalyptus there in the 1920's and 1930's lessened the need for *Polylepis* wood. While in that region, I noticed surprisingly little habitat disturbance, aside from overgrazing from livestock, in the *Polylepis* zone directly above the village (3500 m). Farther away, in my Túpac study area, no evidence of man could be found.

Fortunately *Zaratornis* seems to prefer small, open groves of trees on steep quebrada slopes. It may never have been numerous in the larger tracts of forest that probably once grew in shaded valleys and on more moderate slopes. Today large areas of suitable habitat remain, protected by law, in the Cordillera Blanca south of Yánac. Most of this mountain range is included in the recently created Parque Nacional de la Cordillera Blanca. Additionally, most of the *Polylepis* habitat at Pampa Galeras in Ayacucho is within the boundaries of the Reserva Nacional de Pampa Galeras. These 2 refuges provide protection for a great diversity of Andean vertebrates and plants. Above Lima, suitable *Polylepis* habitat is under little human pressure at the present time, but this may change in the future. The establishment of a *Polylepis* reserve in the Department of Lima is highly recommended. This would greatly facilitate badly needed studies of the flora and fauna of this distinct environment.

TAXONOMY

I agree with Snow's (1973) decision that *Zaratornis* and *Ampelion* are closely related. Similarities can be seen in behaviour (e.g. head bobbing, wing and tail flicking displays in *Zaratornis* are similar to those of *Ampelion*), vocalizations (*Ampelion's* long calls or "song" and call notes are quite like those of *Zaratornis* in quality and pitch) and nest construction (see Vuilleumier 1969 for *A. rubrocristata*). *Doliornis sclateri,* a third member of this group, is morphologically quite like *Ampelion* (and *Zaratornis*), but is divergent vocally; it should also be considered congeneric with *Ampelion.* Another cotingid-like group that resembles *Ampelion* is the Phytotomidae. Behaviourally and vocally plant-cutters are quite similar to *Zaratornis* and *Ampelion* (pers. obs.). Ames (1971) found similarities in syringeal morphology between *Phytotoma* and *Heliochera* (= *Ampelion*).

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